

CHAPTER 3

NES-12 PERSONNEL PARACHUTE SYSTEM

Learning Objective: Upon completion of this chapter, you will be able to understand the theory of operation and perform a special inspection on the NES-12 parachute assembly.

The modern high-performance aircraft used by the Navy today make extreme demands of emergency escape devices. The most critical time for ejection from an aircraft is at low altitudes—especially on takeoffs and landings. The ultimate goal in seat performance (to which engineers have been working) is one that safely ejects the occupant at zero airspeed and at zero altitude, at low altitudes under a high speed, or under other adverse altitude conditions. The system discussed in this chapter gives the aircrewman a zero airspeed and a zero altitude ejection system.

The 1G series ejection seats separate from the aircrewman by means of a rocket that forcibly propels the seat away from the crew member after ejection.

After the aircrew member ejects from the aircraft, a static line on the outside of the container pulls the external pilot chute from its pocket. The sequence of events shown in figure 3-1 commences. This static line is also attached to the arming cable for the automatic parachute ripcord release. The external pilot chute is intended to cause the parachute to open more rapidly, especially at low altitudes or during ground-level ejection. It is of a tristage design and functions as follows: At speeds from 0 to 90 knots, it will inflate to full diameter; at speeds between 90 to 250 knots, the full diameter will reduce to 24 inches; and at speeds in excess of 250 knots, it will invert, but its effective drag will be sufficient to stabilize the aircrew member during free fall and also aid in the extraction of the main canopy during deployment.

At a preset altitude, the automatic ripcord release fires, pulling the ripcord pins from the locking cones, allowing the spring opening bands to open the container. The internal pilot parachute springs from the container and fills with air during

this operation. The external pilot chute release assembly frees the shear link cable when the container opens.

The internal pilot parachute causes the main canopy to be pulled from the container, followed by the suspension lines. A short piece of 18-pound nylon tape is used to momentarily shorten the canopy's effective length during low-speed ejection, which, in turn, promotes more positive opening characteristics. Just prior to full suspension line stretch, the ballistic spreading unfires, forcing the suspension lines out at the skirt hem. This rapidly opens the canopy and allows it to fill with air faster. Ties on the connector links break as load is applied, allowing the risers to be pulled from the container.

NOTE: If the spreading gun fails to fire, the slugs separate from the gun assembly at full suspension line stretch, allowing the canopy to open aerodynamically.

The aircrew member hangs suspended in his harness from the quick-release shoulder fittings during descent. The parachute has the four-line release system that was described previously. By manually actuating this system, the aircrewman is able to maneuver the parachute to a less hazardous landing site and to reduce oscillation during descent. Upon landing, the canopy and suspension lines can be disengaged from the integrated torso suit by means of the quick-release shoulder fittings.

NOTE: After the incorporation of Aircrew System Change 446, the seawater activated release system provides an automatic backup method of releasing the risers after the crew member makes a seawater entry.

ESCAPAC 1G-2 SEAT

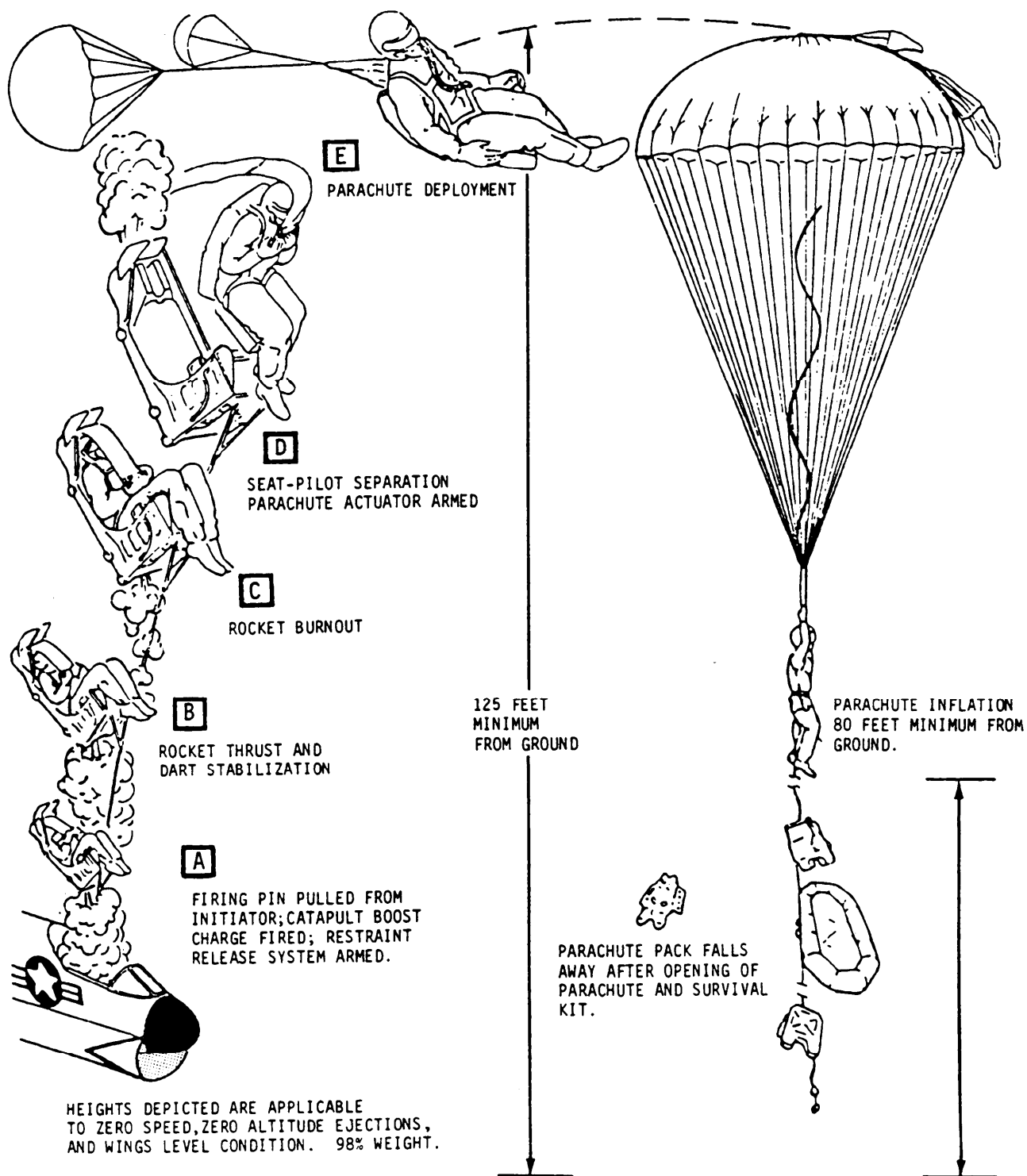


Figure 3-1.—Ejection system sequence of events.

If the aircrew member should have to manually separate from the seat and initiate the parachute operation, only the internal pilot parachute will deploy the main canopy. The external pilot chute bridle is disconnected by

means of the external pilot parachute override disconnect assembly, which is discussed later in this chapter.

The NES-12 personnel parachute (fig. 3-2) is a back-type parachute used with an integrated

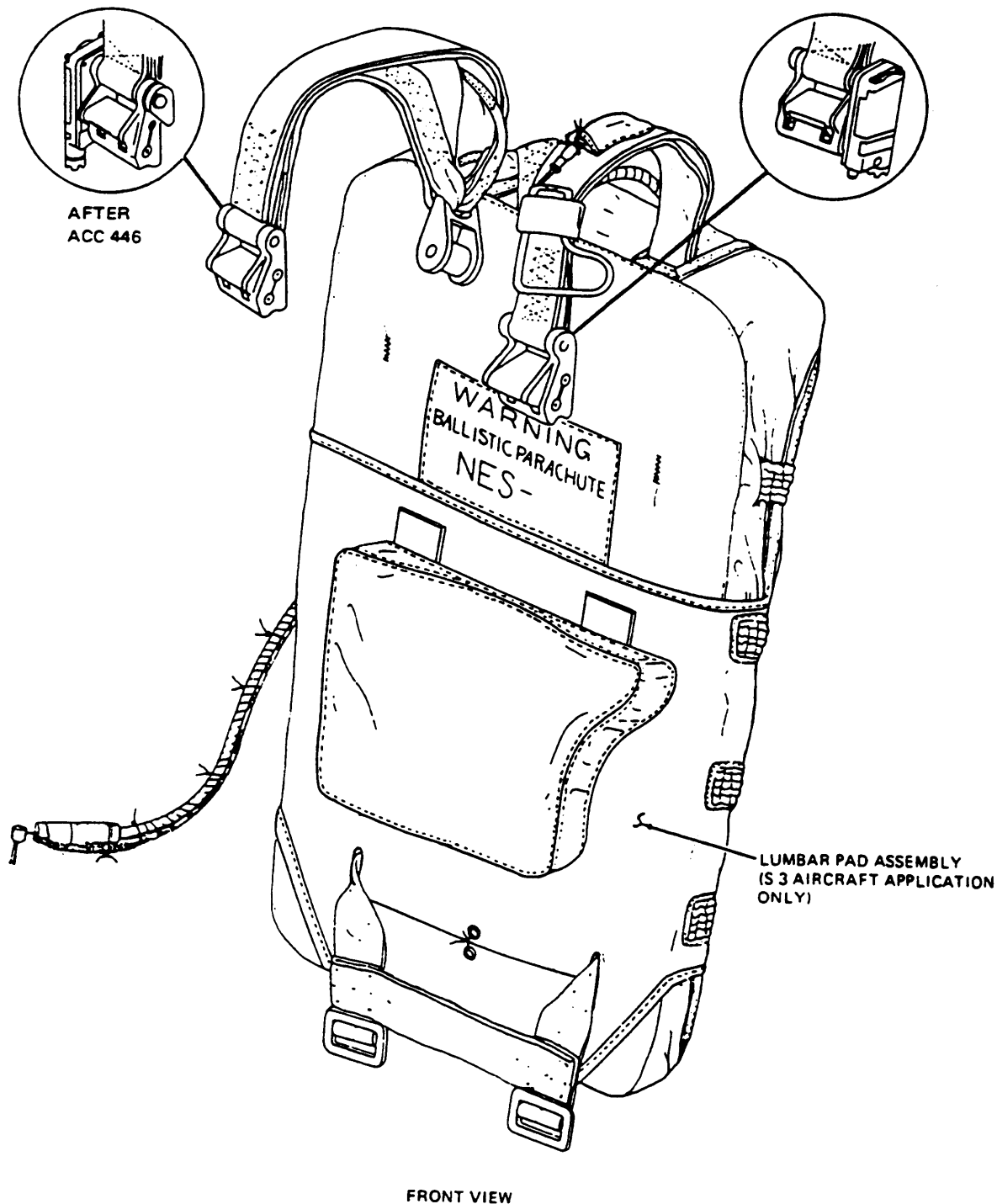


Figure 3-2.—Personnel Parachute Assembly, NES-12.

torso harness suit as part of an ejection seat escape system.

The NES-12 parachute assemblies include a modified 28-foot diameter, flat nylon canopy with 28 gores. A ballistic spreading gun is used to rapidly deploy the canopy. The canopy is packed in a semirigid contoured container. These assemblies also include the tristage external pilot chute (EPC) and an internal pilot chute. The riser assembly, which includes the shoulder restraint system, is rigged to the container and is connected to the torso harness suit with quick-release fittings. The integrated torso harness suit combines the aircrewman's parachute harness and lap and shoulder restraint straps. The harness is channeled through the torso suit to retain it in position and to aid in donning. When aboard the aircraft and seated, the aircrewman connects the quick-release fittings on the parachute riser assembly to the quick-release fittings on the parachute integrated torso suit. The survival kit and the lap restraint system are also connected to the integrated torso suit by means of quick-release fittings.

RIGGING

To obtain the NES-12 parachute, you order each component separately. You must rig the parts together to form a complete assembly. When you start to work on this or any parachute, the rigging and packing will be done under ideal conditions in a parachute loft. When a parachute assembly must be packed under unfavorable conditions, provisions must be made to protect it from possible damage and excessive humidity. Quality assurance (QA) points are included in rigging and packing procedures. When a step is followed by "(QA)," it is a QA requirement. All work STOPS until a quality assurance inspector performs the requirements listed at the end of the applicable procedure.

The packing of a parachute assembly must NOT be interrupted after the packing operation has been started. If unforeseen circumstances cause the packing operation to be interrupted, the parachute assembly must be completely repacked.

The rigging covered in this chapter applies to an original issue parachute assembly.

NOTE: This rate training manual is not to be used as a substitute for the NAVAIR 13-1-6.2 or the NAVAIR 13-600-4-6-3 manuals.

PRELIMINARY PROCEDURES

After you have laid out the parachute and connected the connector links to the proper tension hooks, attach the internal pilot parachute. This is done by routing the small loop of the bridle assembly through the loop in the pilot parachute. Pass the free end (large loop) of the bridle assembly through the small loop, forming a lark's head knot. Draw it tight. Pass one free end (large loop) of the bridle assembly around the canopy vent lines at the peak of the canopy. Pass the pilot parachute through the large loop of the bridle assembly, forming a lark's head knot, and draw tight. Now, attach a tension strap to the canopy vent lines and tighten it.

At this time, you should inspect the complete parachute assembly following the directions in NAVAIR 13-1-6.2 and NAVAIR 13-600-4-6-3. This inspection has been covered in chapter 1 of this manual.

INSTALLATION OF SPREADING GUN

A ballistic spreading gun (fig. 3-3) is used in the parachute. The procedures for inspecting this device was discussed in chapter 2. After the parachute has been inspected and

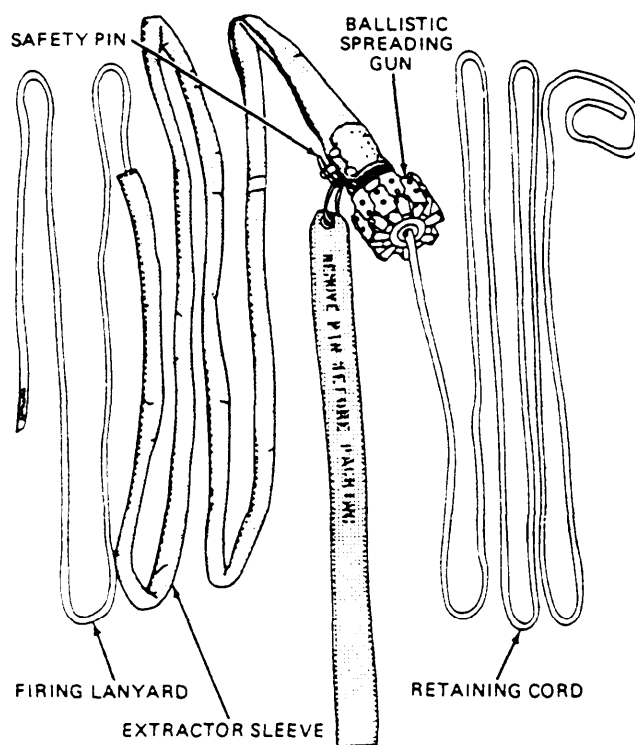


Figure 3-3.—Ballistic spreading gun assembly.

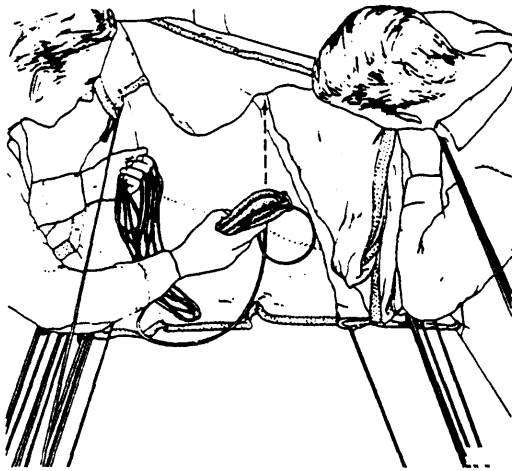


Figure 3-4.—Routing line for pulling retaining cord through canopy.

rigged, install the spreading gun using the following procedures:

WARNING

BEFORE COMMENCING ANY FURTHER OPERATIONS, ENSURE THAT THE SAFETY-PIN IS INSTALLED IN THE SPREADING GUN.

Tie a piece of Type III nylon suspension line 20 feet long to a shot bag (fig. 3-4).

Throw the shot bag attached to the line through the canopy gores so that it reaches the canopy peak. Then pull the shot bag through the vent hem and tie the line temporarily to the vent lines. Secure the bottom end of this line to keep it in place while you whip and fold the canopy. When the canopy has been whipped and folded, tie the free end of this line to the end of the spreading gun retaining cord and pull the retaining cord through the canopy and out the peak.

Untie the Type III nylon line from the retaining cord and vent lines, and route the retaining cord through the lark's head knot in the pilot parachute connector strap and under all the vent lines. The retaining cord has a plastic sleeve that should be centered over the indexing line on the retaining cord. Align the indexing line on the retaining cord above the vent lines.

With the help of a bodkin tool, telescope 2 inches of the retaining cord into itself to form a

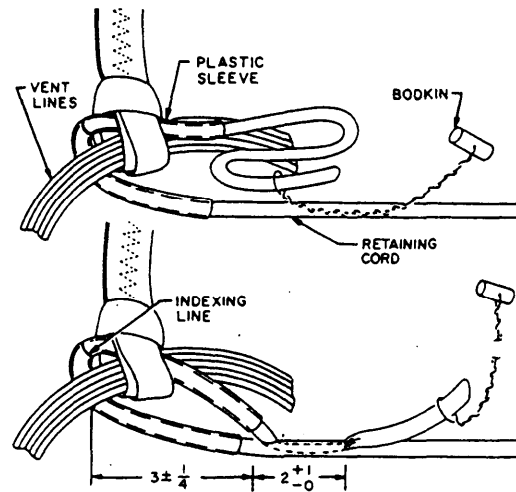


Figure 3-5.—Rigging retaining cord.

3-inch loop ($\pm 1/4$ inch) around the vent lines and connector strap, as shown in figure 3-5. Cut 1 inch off the end of the retaining cord at a 45-degree angle.

Tie a half-hitch around the retaining cord and complete the splice by telescoping the remainder of the end into the retaining cord, as shown in figure 3-6. Work the line until it becomes smooth on the inside of its casing.

Tack the end inside the retaining cord with two turns of waxed nylon 6-cord, doubled. Tie the ends with a surgeon's knot followed by a square knot.

Now position the spreading gun at the skirt hem. Place the spreading gun between the suspension line groups 1 through 14 and 15 through 28 so the retaining cord of the gun faces the canopy peak. Remove the tension strap from the canopy peak.

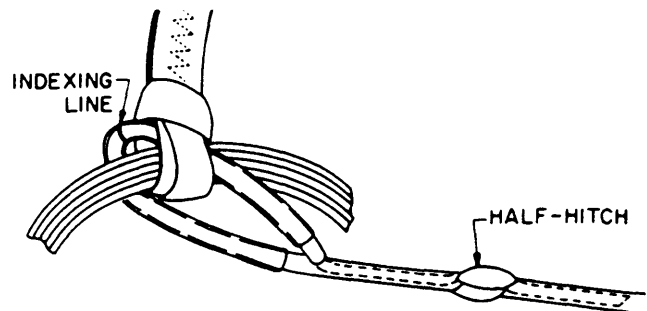


Figure 3-6.—Rigging retaining cord (completed splice).

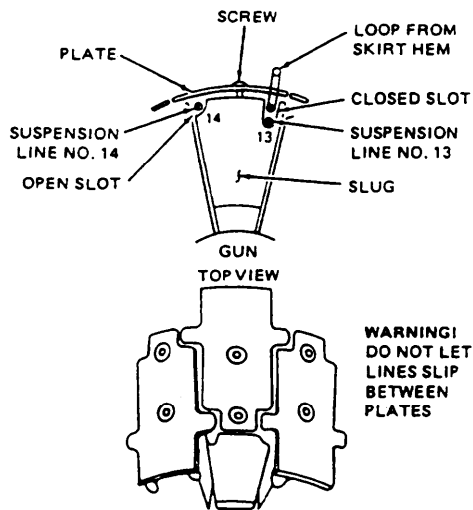


Figure 3-7.—Attachment of spreading gun to suspension lines.

Rotate the gun so the slug labeled “14-13” is facing up, and loosen the screws and plate on this slug. You will find two slots on the face of each slug. One is “closed” or covered when the plate is in place. The other is open to the side of the slug (fig. 3-7). Place suspension line number 13 and one side of the loop of line attached to the canopy hem in the closed slot of the slug (fig. 3-8). Place suspension line 14 in the open slot of the same slug.

Pass the loop around the plate and over the suspension line in the slug. Secure the plate to the slug with screws and ensure the suspension lines move freely in the slots. Torque the plate screws to 6 (plus or minus 1/2) pound-inches and apply red tamper dot.

Secure the remainder of the suspension lines and loops to corresponding slugs in the same manner. Work from suspension line 12 through 1 and from line 15 through 28 (fig. 3-9).

After the above procedures are completed, you must have a QA inspect the completed installation of the spreading gun.

THE EXTERNAL PILOT PARACHUTE

A special feature of the NES-12 parachute is the external pilot parachute. To function properly,

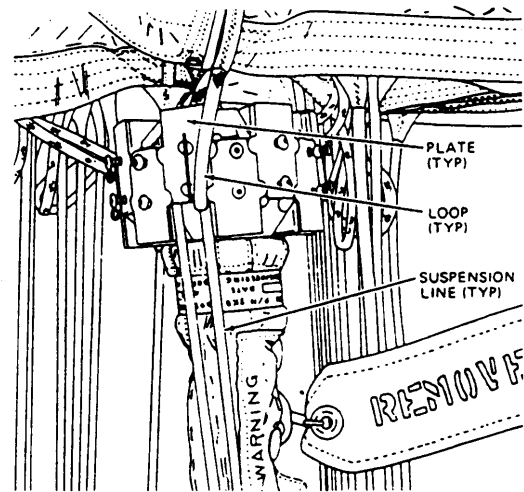


Figure 3-8.—Installing suspension lines.

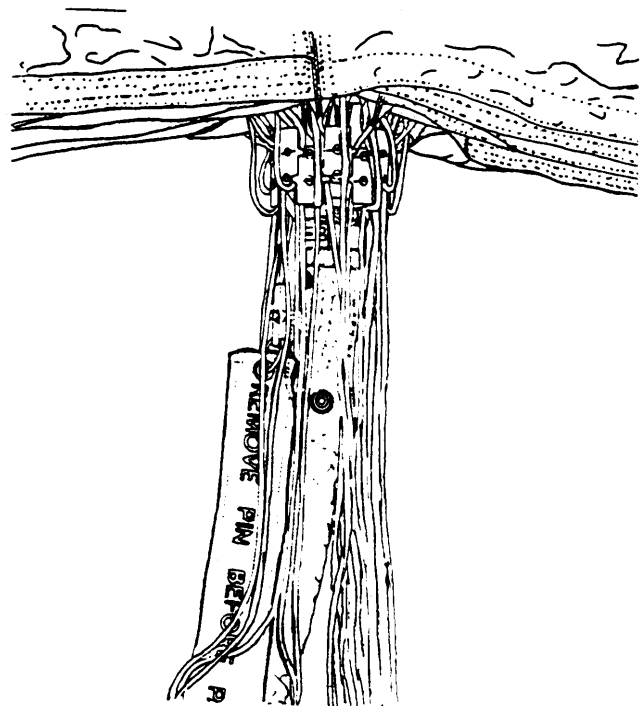


Figure 3-9.—Complete set of suspension lines.

the external parachute is connected to the cord that links the internal pilot chute to the main canopy vent lines. A special device is used to jettison the external chute at high speeds. This device is the override disconnect assembly, shown

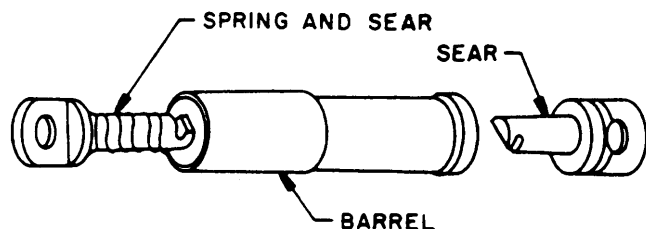


Figure 3-10.—Override disconnect.

in figure 3-10. It consists of two hooks or sears that are kept in engagement as long as they are inside the barrel.

As long as tension is applied to the external pilot chute connection, the override will remain locked. Once the internal pilot chute takes control of the tension, the override connection will release or unlock, allowing the external pilot chute to be released.

To attach the external pilot parachute, proceed as follows:

1. Insert the spring and sear (fig. 3-10) into the wide end of the barrel assembly of the override disconnect. The spring and sear will be connected to the external pilot chute bridle, as shown in figure 3-11. With the aid of a temporary locking

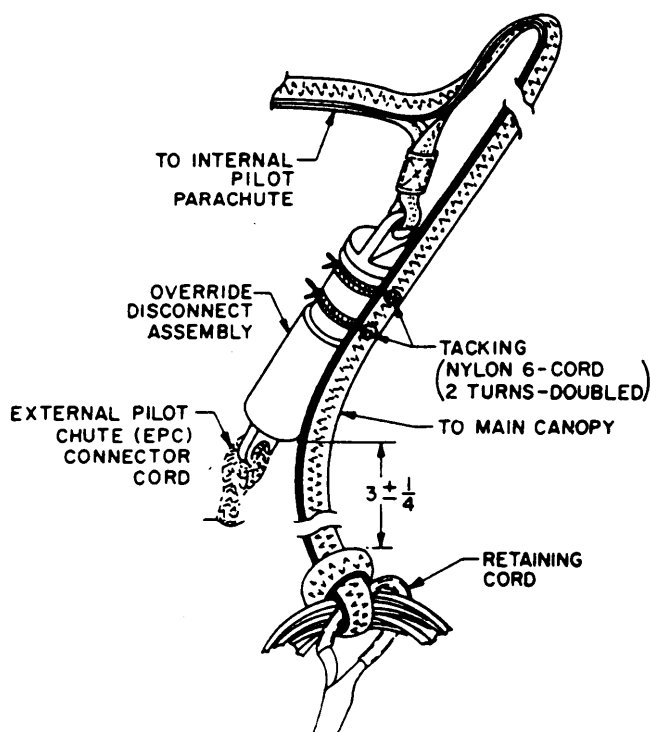


Figure 3-11.—Tacking override disconnects.

pin, push the sear into the barrel until it is protruding from the other end.

2. Engage the sear attached to the internal pilot chute connector cord with the sear, which is protruding from the override disconnect, and release the tension by removing the temporary locking pin. This will cause the two sears to lock within the barrel assembly of the override disconnect. As you can see in figure 3-11, the external and internal pilot chutes are now locked together.

3. Tack the override disconnect to the internal pilot parachute connector strap 3 inches (plus or minus 1/4 inch) above the knot, securing the connector strap to the vent lines at two places. Use two turns of waxed nylon 6-cord (V-T0295), doubled, for each tacking. Tie the ends with a surgeon's knot followed by a square knot.

SUSPENSION LINE CONTINUITY CHECK WITH SPREADING GUN INSTALLED

Although you have checked the continuity of suspension lines prior to installing the spreader gun, they must be checked again to ensure that you haven't gotten any lines out of sequence or have crossed a line causing a twist. To check suspension lines continuity, proceed as follows:

WARNING

ENSURE THE SAFETY PIN IS INSTALLED IN THE SPREADING GUN (FIG. 3-12).

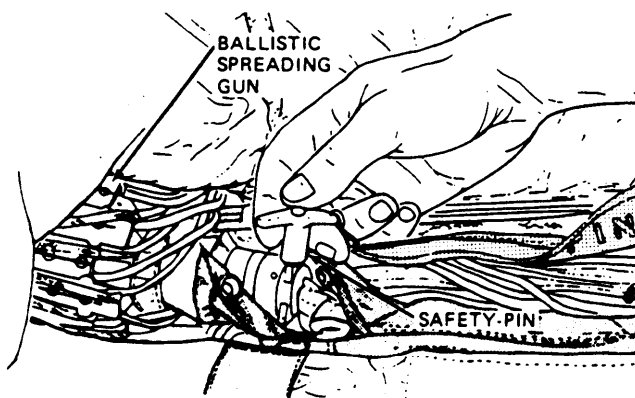


Figure 3-12.—Inserting safety pins.

(21) (20) (19) (18) (17) (16) (15) (14) (13) (12) (11) (10) (9) (8)

(22) (23) (24) (25) (26) (27) (28) (1) (2) (3) (4) (5) (6) (7)

Figure 3-13.—Arrangement of suspension lines on connector links.

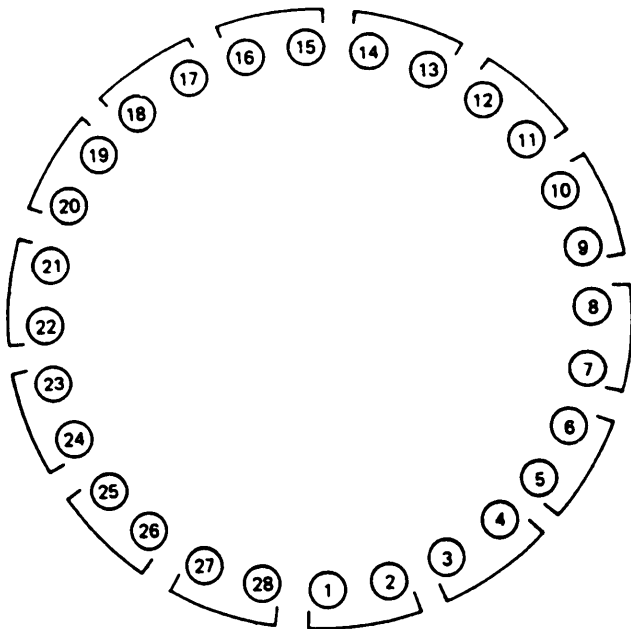


Figure 3-14.—Arrangement of suspension lines on spreading gun.



Figure 3-15.—Straightening canopy gores.

● If the canopy isn't already under tension, attach a tension strap hook to the canopy vent lines and tighten.

● The suspension line must be arranged on the connector links, as shown in figure 3-13, and on the spreader gun, as shown in figure 3-14. The spreader guns must be turned so that suspension lines 15 and 14 face up. The suspension lines must pass through corresponding numbered slots in the spreading gun slugs. Ensure that the loops attached to the odd numbered suspension lines pass through the slots in the odd number of slugs.

● Suspension lines must run free from the skirt hem, through the corresponding numbered slot in the spreading gun slugs, and to the connector links without any dips or twists.

STRAIGHTENING CANOPY GORES WITH SPREADER GUN INSTALLED

It would be impossible for you to whip and fold a canopy with a spreading gun installed. For this reason you will have to straighten the gores instead of whipping and folding. Always ensure the safety pin is installed in the spreading gun and the spreading gun firing lanyard is detached from the connector link.

1. The helper should place a shot bag on the helper's side of the skirt hem.
2. The packer rotates all gores on the packer's side as a group, except the bottom gore; it goes over to the helper's side of the packing table. The packer straightens and smooths the bottom gore on the packer's side of the table throughout its length to the peak.
3. The packer returns each gore above the shot bag on the helper's side of the packing table to the packer's side, one at a time. Each fold is straightened and smoothed, as shown in figure 3-15.
4. The folded gores on the helper's side should be straightened and smoothed in the same manner.

STOWAGE OF FIRING LANYARD INTO EXTRACTOR SLEEVE

In stowing the firing lanyard into the extractor sleeve, you must first remember not to remove the spreading gun safety pin at any time during this procedure.

Now you open the extractor sleeve fasteners on each side of the spreading gun safety pin; release the fastener holding the stowage sleeve to the extractor sleeve; and remove the stowage sleeve from the extractor sleeve, as shown in

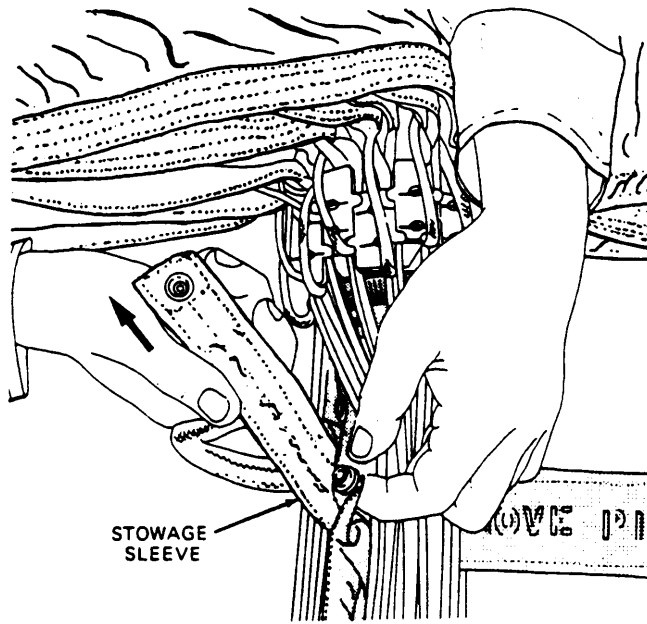


Figure 3-16.—Removing stowage sleeve.

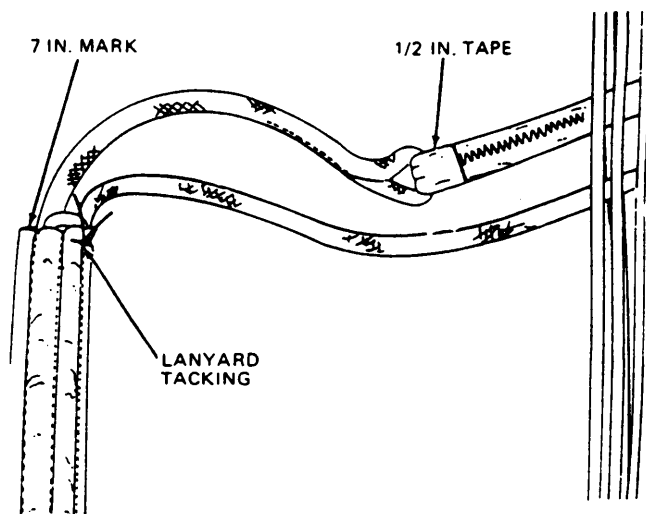


Figure 3-17.—Inspecting firing lanyard.

figure 3-16. Inspect the firing lanyard for proper stowage, as shown in figure 3-17.

In this inspection you may find that the firing lanyard has been pulled out of the stowage sleeve, or it may have been improperly stowed. To restow the firing lanyard, cut a piece of Type I nylon cord 30 inches long. This will aid you in stowing the lanyard.

Measure 7 inches from the sewn loop at the top of the firing lanyard and make a mark. This mark will leave you 7 inches of slack between the

sewn loop and the stowage sleeve. Form a bight the length of the stowage sleeve in the firing lanyard, and by using the Type I cord and a bodkin, pull the firing lanyard into the stowage sleeve, stopping at the bottom of the sleeve. (See figures 3-18 and 3-19).

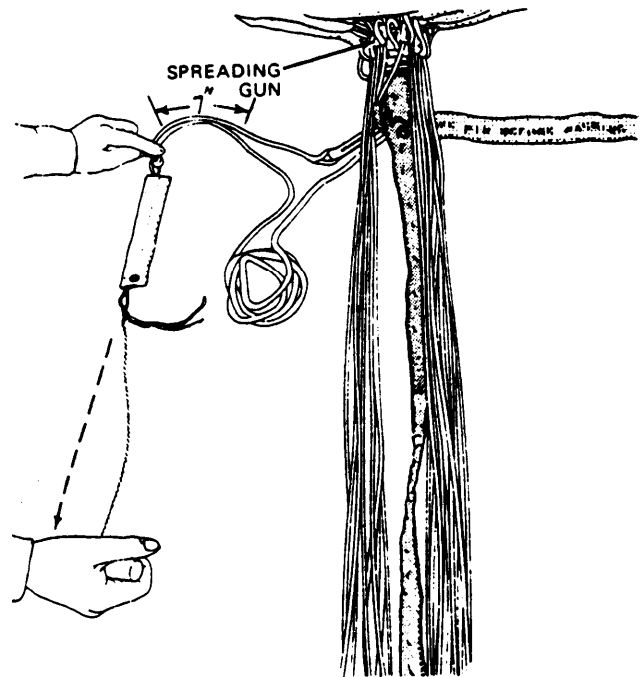


Figure 3-18.—Stowage sleeve and firing lanyard.

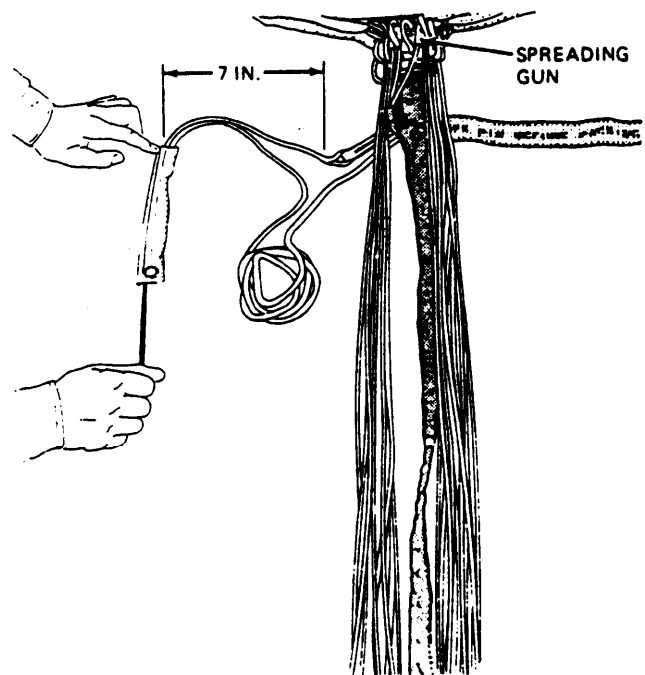


Figure 3-19.—Stowing firing lanyard.

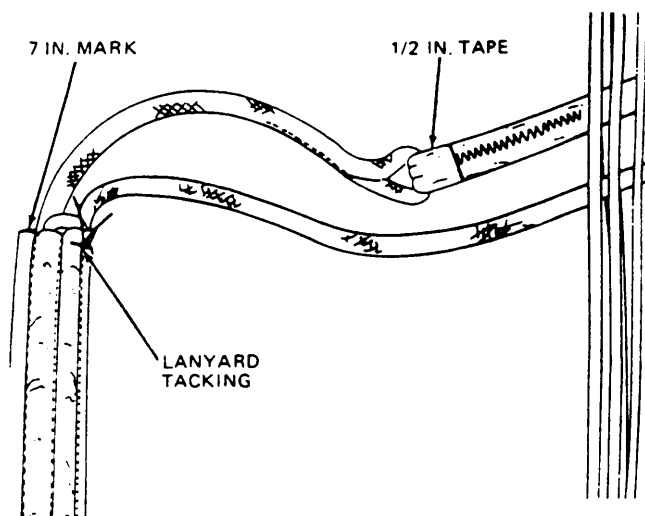


Figure 3-20.—Lanyard tacking.

Slowly remove the Type I line from the firing lanyard bight. Rapid removal of the Type I line from a firing lanyard bight could damage the lanyard. Form and stow an 8-inch bight of firing lanyard in the remaining stowage sleeve channel in the same manner. Tack the second lanyard bight to the stowage sleeve with one turn of waxed size A nylon thread, single. Tie the ends with a surgeon's knot followed by a square knot (fig. 3-20).

Insert the stowage sleeve into the extractor sleeve, open end first (fig. 3-21). Engage the fastener on the stowage sleeve to the fastener on the extractor sleeve. Engage the extractor sleeve fasteners on each side of the safety pin (fig. 3-22).

INSTALLATION OF AUTOMATIC PARACHUTE RIPCORD RELEASE ASSEMBLY

You have read about the automatic parachute ripcord release in chapter 2 of this manual. At this time, you will see how it is installed into a container. Before you actually attempt to install a release assembly, (fig. 3-23), you must first make sure that the inspection requirements in the NAVAIR 13-1-6.2 and the NAVAIR 13-600-4-6-3 have been complied with.

Now you are ready to proceed with the installation.

First, rotate the risers over the suspension lines and position the container on the packing table so that the bottom end is towards the canopy and

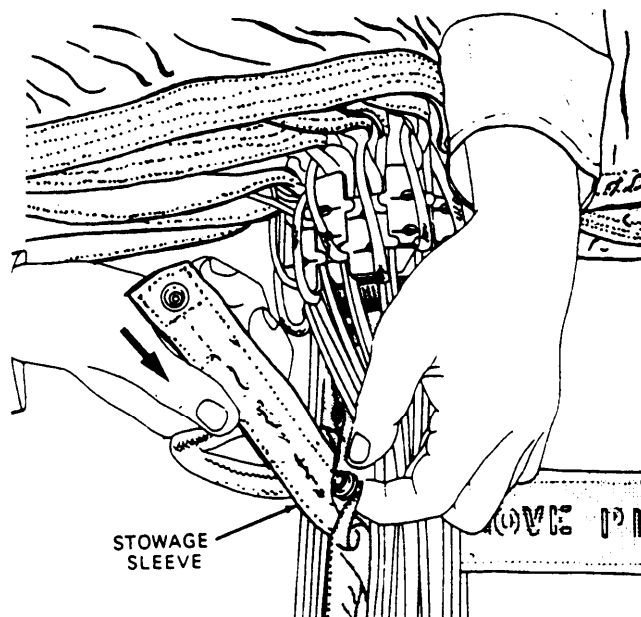


Figure 3-21.—Inserting stowage sleeve.

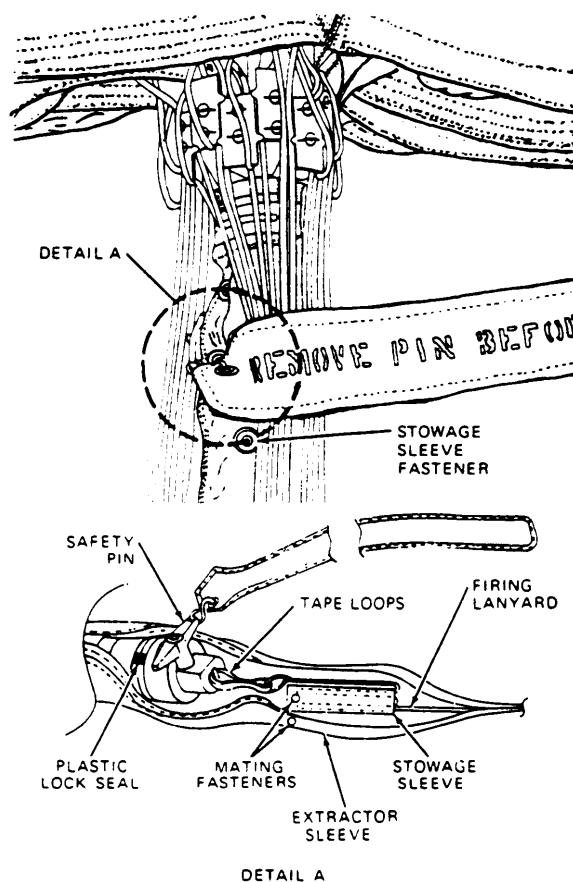


Figure 3-22.—Engaging snaps.

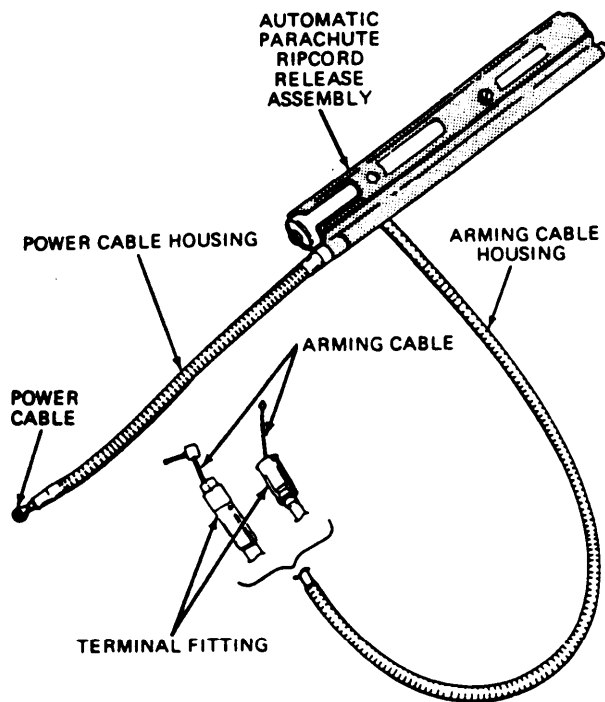


Figure 3-23.-Automatic parachute ripcord release assembly.

the inside faces up. Attach and crimp one end of both short container spring opening bands to the container eyes with hooks facing down (fig. 3-24).

You will find that different parachutes use different lengths of arming cables. There are also several different time-delay cartridges that can be used at this time. Before you attempt to install the arming cable or the cartridge, check the NAVAIR 13-1-6.2 to ensure you are using the right ones.

Inspect, arm, and assemble the automatic parachute ripcord release in accordance with the NAVAIR 13-1-6.2. Record the time delay, lot number, DODIC, part number, type of cartridge, and the expiration date on the Parachute Configuration, Inspection, and History Card.

Now you are ready to install the ripcord release into the ripcord release pocket, close the slide fastener, and secure the protector flap.

Insert the power cable through the buttonhole in the top end of the container. Route the end of the arming cable housing through the housing port located in the right side of the release pocket and through the buttonhole located on the right side of the container (fig. 3-25).

Close the fastener flaps of the release pocket.

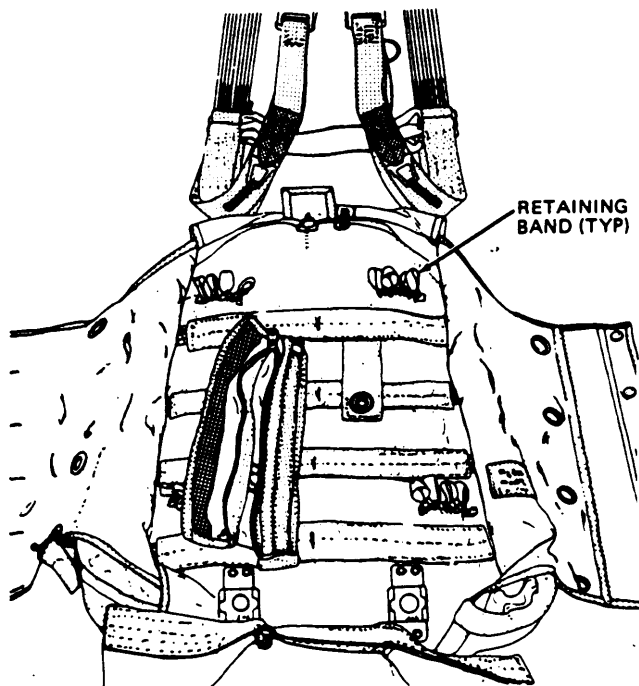


Figure 3-24.-Installing retaining bands.

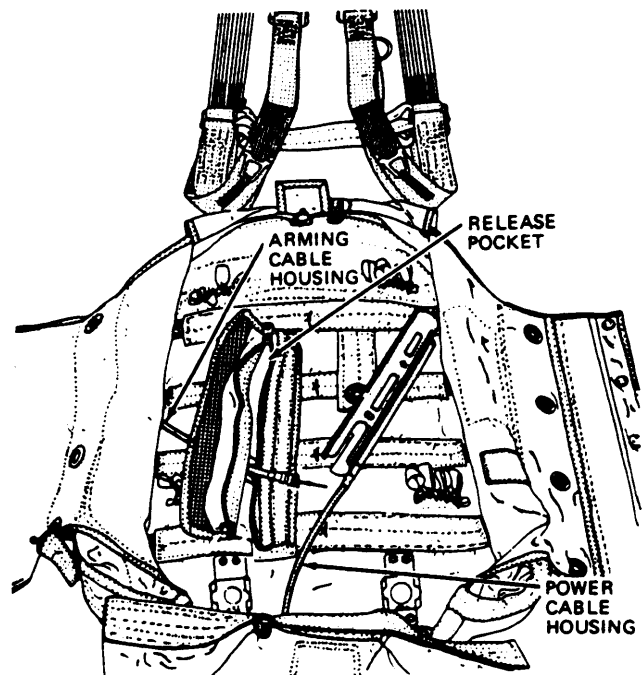


Figure 3-25.—Inserting power cable.

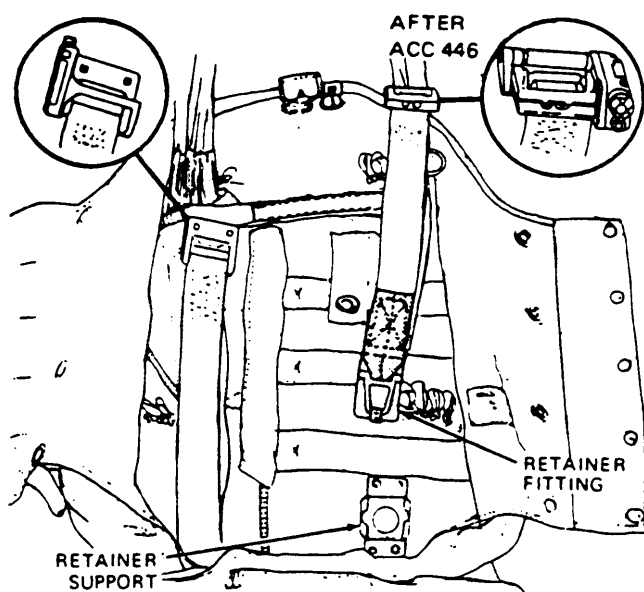


Figure 3-26.—Rotate risers.

ATTACHMENT OF CONTAINER ASSEMBLY TO RISER ASSEMBLY

To attach the container assembly to the riser assembly, you must remove the tension strap from the canopy peak, and remove the tension hooks from the connector links and the packing table. Rotate the risers onto the container, and secure the riser retainer fittings to the riser retainer supports (fig. 3-26). Now, position the lift web protector flaps over the riser and install the break cords. These two break cords, approximately 2 inches apart, are constructed with one turn of waxed size FF nylon thread, doubled. Pass the threads through the protector flap, under a support, up through the protector flap, and tie them snugly with a surgeon's knot followed by a square knot, as shown in figure 3-27. Repeat this procedure for the other riser.

INSTALLATION OF CONNECTOR LINK TIES

The connector link ties are a very important part of the rigging of the NES-12 and other parachutes that use the ballistic spreading gun. Not only do they prevent the risers from moving around inside of the container, they also prevent the premature deployment of the risers (riser blowout), which could cause line entanglement or premature firing of the spreader gun and provide an anchor point for the firing of the spreader gun.

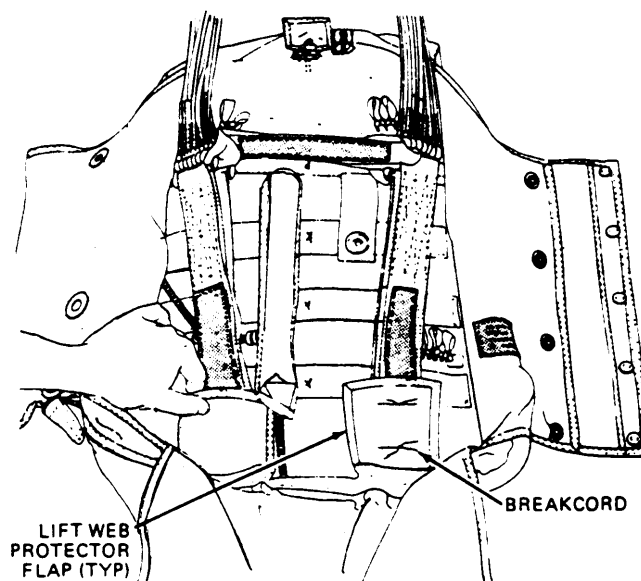


Figure 3-27.—Installing break cords.

To install connector link ties, proceed as follows

Cut two 12-inch lengths of 100-pound nylon cord and sear the ends. (Do not use waxed cord). Then, form a 1-inch loop in one end of each of the cords and secure with a bowline knot. Tie an overhand backup knot in the end of the cord (fig. 3-28).

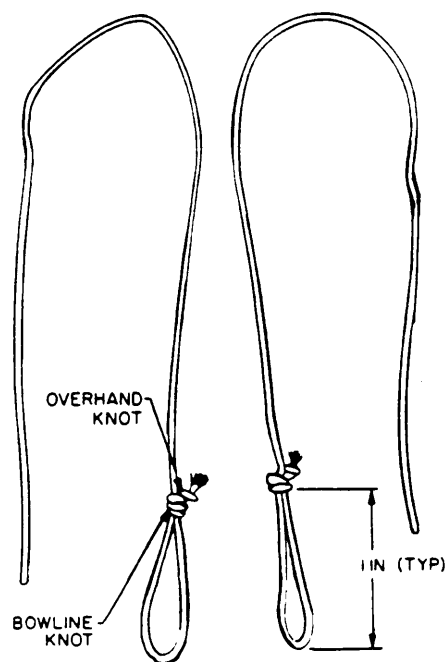


Figure 3-28.—Connector link ties.

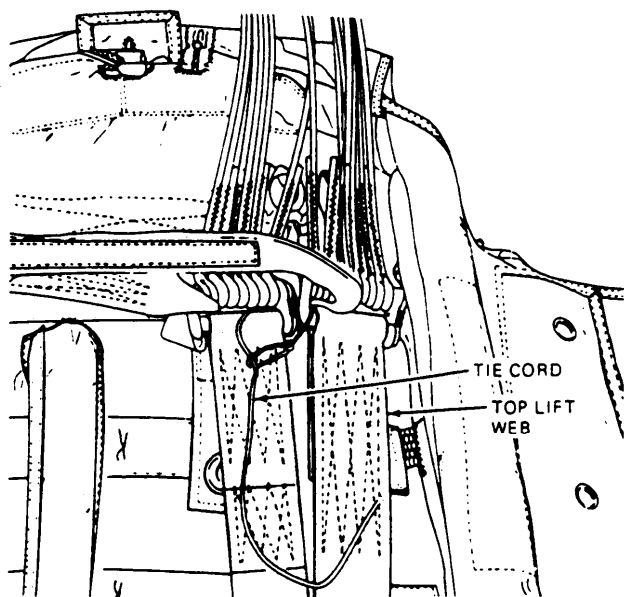


Figure 3-29.—Tying connector links.

Now position the connector links side by side so that the top connector links are to the right of the bottom connector links, then form a noose around the connector links located on the helper's side with one of the 100-pound tie cords, as illustrated in figure 3-29.

Tighten the noose and tie the free end of the tie cord to the bottom inboard cloth retaining band loop with three to four half-hitches. Trim excess cord.

Using the other tie cord in the same manner, secure the connector links on the packer's side.

INSTALLATION OF RELEASE ASSEMBLY LANYARD AND RIPCORD ASSEMBLY

Proceed in installing the lanyard release and ripcord assemblies by marking the clamp release lanyard 36 inches from the locking pin end. Next, fold the top end flap onto the container so that the baseplate faces up.

WARNING

ENSURE THAT THE BASEPLATE CLAMP IS POSITIONED OVER THE HEX NUT PRIOR TO INSTALLING THE LOCKING PIN (FIG. 3-30).

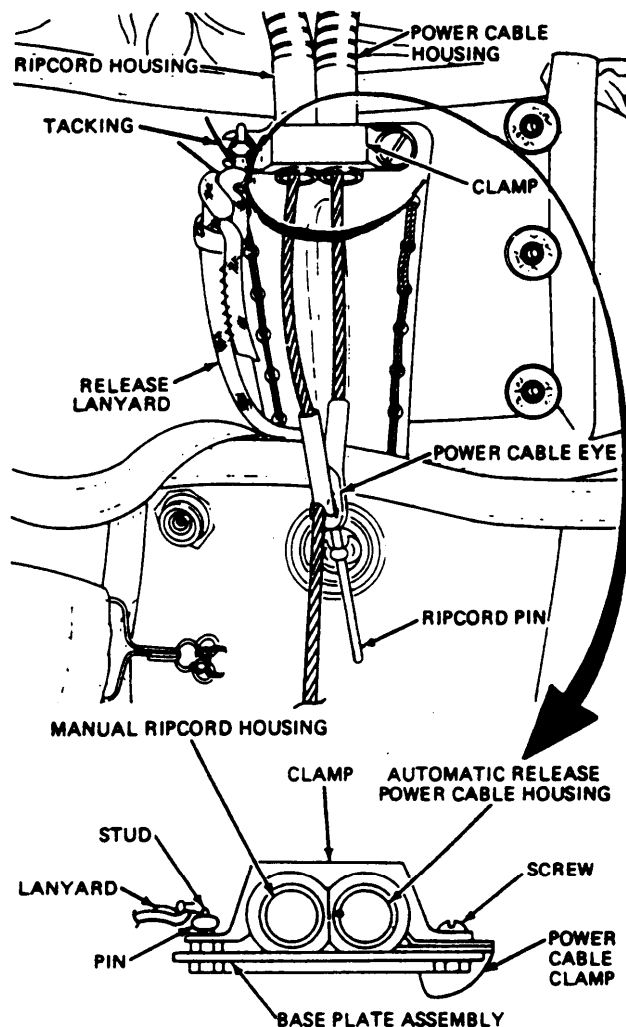


Figure 3-30.—Release lanyard assembly.

Now, position the clamp over the end fitting of the power cable housing. Insert the baseplate screw through the clamp holes and into the right-hand baseplate hole so that the clamp flange fits over the end of the baseplate, shown in figure 3-30.

Position the large slotted end of the baseplate clamp under the screwhead on the baseplate. Position the manual ripcord housing and power cable housing under the clamp with two flat sides together and the other two flat sides positioned against the baseplate. Place the clamp in the clamping grooves of the two housings. Position the small slotted end of the baseplate clamp over the baseplate stud. Insert the release lanyard locking pin into the stud hole. Secure the clamp in place. The locking pin should be finger tight; if necessary, slightly loosen the screw. Ensure the

two housings are correctly positioned and securely retained. Safety-tie the locking pin to the stud with one turn of waxed size FF nylon thread (V-T-295), single. Pass the thread through the lanyard knot and tie the ends with a surgeon's knot, followed by a square knot.

The next procedure is to insert the top ripcord pin through the beveled side of the eye in the power cable. Route the lanyard over the helper's side of the top end flap V. Tack the lanyard to the top end flap at the V with 1/8-inch slack between the locking pin and the tacking, passing the tacking around the lanyard. Use one turn of waxed size E nylon thread, single. Tie its ends with a surgeon's knot, followed by a square knot (fig. 3-31).

Route the lanyard along the inside of the top end flap to the helper's side of the automatic actuator power cable buttonhole. Tack the lanyard to the upper edge of the container with one turn of single, waxed, size E nylon thread (fig. 3-32), allowing 1/8 inch of slack between the tackings. The tacking must pass around the lanyard and not through it. Tie the ends with a surgeon's knot, followed by a square knot.

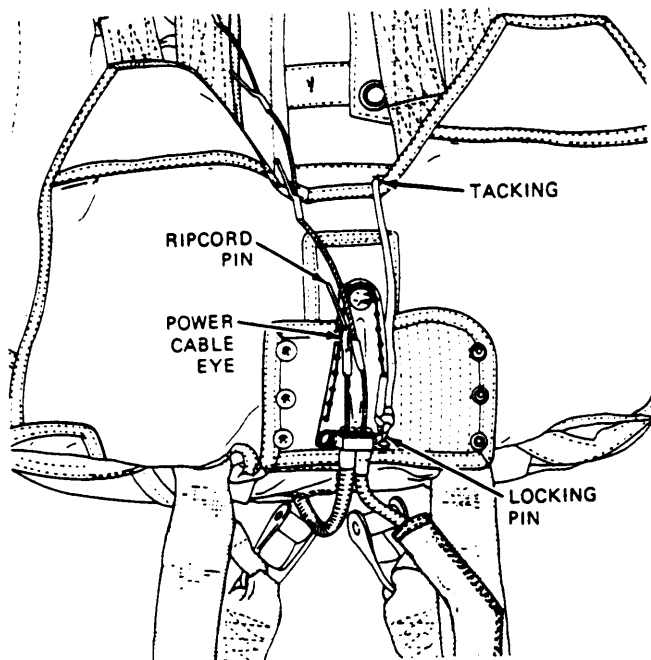


Figure 3-31.—Tacking locking pin.

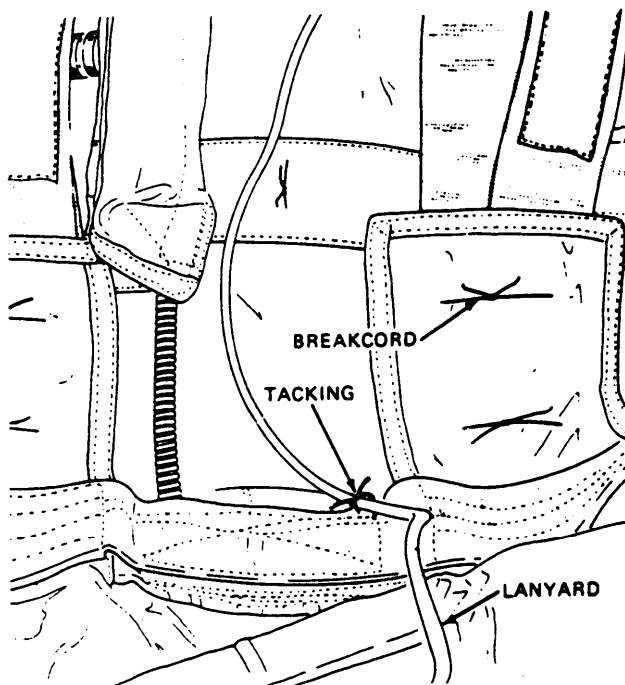


Figure 3-32.—Tacking release lanyard.

Reeve the lanyard through the lanyard guide grommet (fig. 3-33). Place the 3'6-inch mark on the lanyard over the bar on the inboard connector link located on the helper's side. Secure the lanyard to the connector link bar with a bowline knot. Ensure the lanyard is positioned between the webbing and the connector link end. Tie an overhand backup knot in the end of the lanyard.

You should have the QA inspect your work at this point.

ATTACHMENT OF FIRING LANYARD TO SUSPENSION LINE CONNECTOR LINK

Before attaching the firing lanyard, ensure that the safety pin is installed in the spreading gun. Then starting at the gun, route the firing lanyard between suspension lines 7 and 8. Slide the canopy towards the container and form an S-fold in the suspension lines large enough to allow the loop in the end of the firing lanyard to align with its connector links. Be careful to check to see that no suspension lines are dropped from the connector link bar.

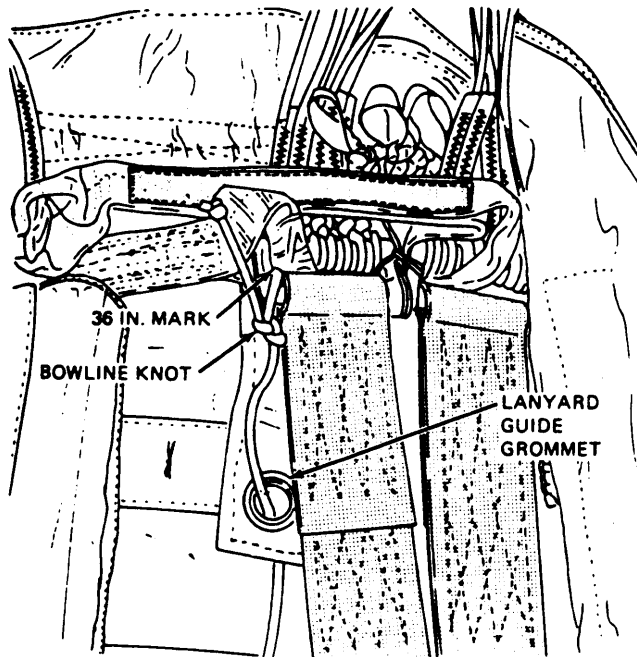


Figure 3-33.—Reeving release lanyard.

As you have read this chapter on the NES-12, you may have noticed that each time you have removed the yoke and plate assembly from the connector link, you have been told to tighten and torque the screw when reassembling the connector

link. This was done to prevent the torquing from being missed if you were only performing one of the many operations that require you to remove and replace the yoke and plate. If you have performed all the operations described, then, at this time, you do the final torquing before the suspension lines are placed into the container. Therefore, it is very important that you complete this process in the following manner and have it inspected.

Remove the yoke and plate assembly on the outboard top connector link located on the helper's side. Insert the connector link bar through the loop in the firing lanyard and reattach the yoke and plate assembly. Tighten the screw to a torque value of 20 to 25 pound-inches. Apply a tamper dot to the connector link screwhead using lacquer (TT-L-32, color 11136, insignia red or equivalent).

At this point, you have completed the rigging and you are ready for the packing procedure.

When actually performing any of these procedures, you should refer to the NAVAIR 13-1-6.2 and NAVAIR 13-600-4-6-3. Also, you will find that some of your rating exam questions will be taken from these NAVAIR manuals.

